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AUTHOR Morrissey, Kristine A.
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ABSTRACT

The Michigan State University Museum used an interactive videodisc (IVD) as an introduction to a special exhibit, "Birds in Trouble in Michigan." The hardware components included a videodisc player, a microcomputer, a video monitor, and a mouse. Software included a HyperCard program and the videodisc "Audubon Society's VideoGuide to the Birds of North America: I." Designed to act as a conceptual pre-organizer, the HyperCard program used computer-generated text screens and segments from the videodisc to introduce vocabulary and discuss concepts and principles illustrated in the exhibit. Video segments also provided a context for observing the mounts by discussing identification and illustrating bird behavior in their habitats. The study took place over 10 weekend days with 5 days randomly assigned to control and 5 to experimental conditions. Under experimental conditions, the IVD system was set up for a 2-hour period outside the entrance to the exhibit hall. All visitors during the data collection periods were videotaped, and the HyperCard program recorded visitors' responses under the experimental condition. It was found that the presence of the IVD program significantly increased visitors' time within the exhibit area; groups with children were more likely to use the program than adult only groups; groups with males (either adult or children) were more likely to use the program than those with females; and 75% of the program users selected a unique path through the program. These results suggest that interactive video can be used effectively as a pre-organizer for a museum exhibit, and that it encourages learning by enabling visitors to actively research their own interests. Ten sample computer screens are appended. (12 references) (BBM)

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Title:

Interactive Video and Informal Learning Environments

Author:

Kristine A. Morrissey

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Introduction

Each museum visitor walks through the door with a unique set of experiences, capabilities, preconceptions and anticipations. These differences influence the way visitors move through the museum, the things they attend to, and the ways they interpret and process the information. A family attempting to share "quality time" browses through the hands–on area, a graduate student in paleontology completes a class assignment by studying fossils from the Cambrian Period, and a teacher brings his students to encourage an appreciate of their heritage. Museums respond to these heterogeneous audiences without the benefit of external controls and strategies for monitoring learning that are available to formal learning institutions (such as grades, tests, and prerequisites); it is not surprising that visitor learning can be unpredictable and different from that which the exhibit designers imagined.

To encourage visitor learning, it is not enough to exhibit a collection in an aesthetically pleasing and scientifically correct display; the visitor needs guidance ". . . in learning what to attend to, how to attend to it, how to think about what is observed and to process relevant information" (Koran, Jr., Koran, Foster, 1989, p. 76). Interpretive media provide an interface between the visitor and the objects; they introduce, describe, and surround objects with a cultural, scientific, or historical context. They focus attention on critical attributes, cue visitors to intended learning, and elicit participation. Museums commonly use printed labels, brochures, slide tape presentations, models, dioramas, and audio and video tapes as interpretive media. Museum educators and exhibit designers are now exploring the capabilities of interactive technologies including hypermedia, multi–media, and other computer–mediated presentations such as interactive video. The capabilities of these media suggest the potential for interpretation that affords greater flexibility and control over learning to a range of visitors.

The Study

Interactive videodiscs are becoming increasingly popular in museum settings because their capabilities (including interactivity, durability and vast storage potential of laser discs, and the high quality of audio and video) seem to be an appropriate match for the instructional conditions and learning objectives of museums. This paper discusses a research project conducted at the Michigan

State University Museum which used an interactive videodisc (IVD) as an introduction to a special exhibit "Birds in Trouble in Michigan." The hardware components included a videodisc player (Pioneer 2000), a computer (Macintosh Plus), a video monitor, and a Kensington TurboMouse. Software included a HyperCard program and the videodisc "Audubon Society's VideoGuide to the Birds of North America: I."

The IVD program was designed to act as a conceptual pre–organizer. Presented before the visitor enters the exhibit, pre–organizers provide a way to organize or structure the information in the exhibit. The amount of novel stimuli in a museum can overwhelm visitors making it difficult for them to focus their attention for a sufficient amount of time for information processing to occur (Koran, Jr., Longino, and Shafer, 1983). Conceptual pre–organizers can overcome this problem by orienting visitors to what they are about to see; visitors can then "better process what they see, adopt strategies appropriate to their interests and time, and ignore details and elaborations that may cause unnecessary confusion and overload" (Screven, 1986, p. 124). The HyperCard program designed for this project used computer generated text screens and segments from the videodisc to introduce vocabulary and discuss concepts and principles illustrated in the exhibit such as "extinction" and the relationship between survival and loss of habitat (see Appendix A for sample screens from the HyperCard program). Video segments also provided a context for observing the mounts by discussing identification and illustrating bird behavior in their habitats.

Research Questions

1. "Will an interactive video program used as a conceptual pre–organizer increase visitors' time within an exhibit?" Museums are by their definition, a place that houses, displays, and studies collections. However, rather than directing visitors' attention to the exhibit, the novelty of the device and the energy and excitement of sound, color, and motion could distract attention from the exhibit. If the program was an effective conceptual pre–organizer, the study hypothesized that visitor time within the exhibit area would be increased by the addition of the program. Attention has long been used as an indicator of museum learning and elapsed time within an exhibit, the most commonly used measure of attention, has been consistently correlated with

both cognitive and affective outcomes (Falk, 1983; Koran, Jr., Foster and Koran, 1989).

2. "What types of visitors will use the program?" The term "attracting power" has been used to refer to the ability of an exhibit or device to attract the viewer. In a free–choice setting, any device or exhibit must first attract and hold visitors' attention before learning can take place. In a symposium of media comparison studies at this conference two years ago, it was argued that the learner's attitude toward a medium can influence whether he or she attends to the medium and can interact with the message to either promote or deter learning (Yacci, 1989). Visitor studies suggest that there is indeed a relationship between the type of medium and its attracting power (Screven, 1975; Beer, 1987) and the attracting power is not always related to its instructional impact. To make decisions about the design of interpretive media, museum educators must know not only which medium can support the necessary instructional strategies, but also which medium will attract the targeted audience.

This study was interested in the type of visitors the IVD system would attract. Two variables were selected as likely to influence whether visitors used the program: "composition of the group" (number of adults and/or children) and "gender" of group members. Groups were investigated rather than individuals because most visitors are part of a social group and their behavior and expectations are influenced by the members and context of the group (Dierking, 1989; Kropf, 1989).

3. "How will visitors respond to the levels of options offered by the program?" The ability to give the user control over variables such as the content, sequence, or pace of presentation is intuitively attractive to the museum educator interested in meeting the needs of a heterogeneous audience. However, research does not support the assumption that user control is always advantageous but rather suggests that learners respond differently to these options. This issue is further complicated for museums as most interactive media research has been conducted in formal settings and the results may not pertain to informal learning environments.

This study did not attempt to resolve the complex issues associated with user control variables; instead, it attempted to identify whether two variables ("interest in birds" and "computer comfort") were related to the types of choices made by visitors. Two levels of menus were offered with the second level offering more information and examples. The study hypothesized that if visitors' choices were conscious selections based on interests and abilities, there would be a relationship between their interests and their interaction with the program. Visitors with low interest in the subject would be less likely to ask for more information or examples than those with high interest. Users' comfort level with the computer might also influence the interaction, with "high–comfort" users selecting more options and "low–comfort" users confining their choices to the main menu.

Methodology

The study took place over ten weekend days with five days randomly assigned to control and five to experimental conditions. Under the experimental conditions, the interactive videodisc system was set up for a two hour period outside the entrance to the exhibit hall. On control days, the system was not present. A video camera was mounted outside the exhibit area with a view of the IVD station and one wall of the exhibit (see Figure 1). All visitors entering the exhibit area during the two hour data collection periods on control and experimental days were part of the study. A total of 366 groups were included, with 181 groups visiting on the experimental days and 185 on the control days. The number of individuals in each group ranged between 1 and 8.

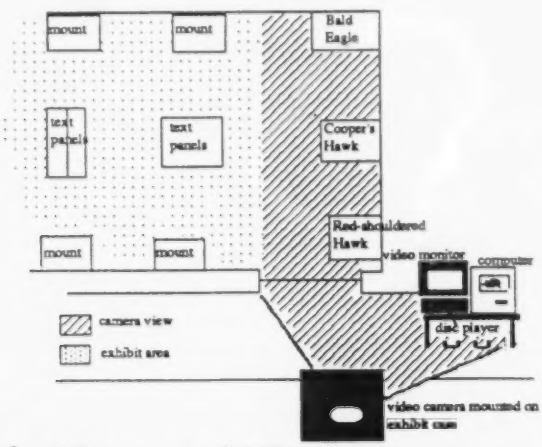

Figure 1. Diagram of exhibit area and IVD program

The videotapes were analyzed to identify the mean time spent within the exhibit area and mean time in front of two specific bird mounts (Bald Eagle and Red-shouldered Hawk). The mean times on the control days were compared to the mean times on the experimental days (with the IVD program available outside the exhibit). All groups were coded by their composition and the gender of the adults and children. Groups who used the program were compared to all groups using chi-square. The HyperCard program recorded all selections made by each group and asked each group to identify interest in birds ("High", "Medium", "Low") and if they were comfortable with computers ("Yes", "Somewhat", "No"). Each group was coded as a Level One user if all selections were from the Main Menu and as Level Two if at least one secondary menu was used. Level One and Level Two users were compared (using chi-square) on "computer comfort" and "interest in birds."

Results

Table 1a shows the difference in mean times within the exhibit area between the control group and the experimental group (including those who used the program and those who did not.). On experimental days, the mean time of 167 seconds was significantly higher than the mean of 126 seconds on control days (ANOVA, $p<.001$). This suggests that the IVD program did not compete for visitors' attention but increased their time within the exhibit.

Table 1b compares the mean times in front of the Red-shouldered Hawk and the Bald Eagle mounts. On the experimental days, the average viewing time for the hawk was 3.2 seconds, which was statistically higher (ANOVA, $p<.001$) than the 1.2 seconds on control days. The mean time for the eagle was 8.4 seconds on the control days and 8.5 seconds on the experimental days, which was not significantly different. The differential effect cannot be readily explained; possibly visitors were less familiar with the hawk, and therefore the program had more influence on their behavior related to it.

During the experimental days, visitors who did *not* use the program spent an average of 160 seconds in the exhibit area, which was significantly more time than the 126 seconds of the control group (ANOVA, $p<.004$). Three possible explanations for this interesting phenomenon are: 1. Many visitors were "peripheral viewers"—watching over the shoulders of other groups but not

actually using the program. They may have seen a brief segment or text screen that influenced their behavior. 2. The presence of the IVD program may have instigated associations and expectancies that resulted in increased attending behaviors; visitors may have assumed that "this exhibit is important." 3. Those who used the program became more involved with the exhibit, and their behaviors were then imitated by non–users. Modeling has been suggested as a strong factor in the behavior of museum visitors (Koran, Jr., Koran, Dierking, and Foster, 1988).

Table 1a

Elapsed Time Spent within Exhibit Area

	Groups	Mean time within exhibit
Control days	181	126 seconds*
Experimental days	185	167 seconds*
Combined	366	145 seconds

** Statistically significant, p<.001*

Table 1b

Viewing Times at Two Mounts

	Control days	Experimental days
Red–shouldered Hawk	1.2 seconds *	3.2 seconds*
Bald Eagle	8.4 seconds	8.5 seconds

** Statistically significant, p<.001*

Characteristics of Program Users

Both variables investigated ("group composition" and "gender") were significantly related to use of the program (chi–square, p<.001). Groups with children were more likely to use the program than those with adults only. Groups composed of a single adult with children showed the highest incidence of program use. This group also averaged the least time within the exhibit when the program was not present (104 seconds). Interactive programs may attract visitors who can most benefit from the guidance.

Table 2 identifies the percentages of experimental groups that used the program broken down by gender of the adults (by column) and of the children in the group (by row). Each cell identifies the percentage of the experimental groups (with that particular description) that used the program. Comparing the row for groups with girls to the row for groups with boys shows that in each of the three categories, groups with boys were at least twice as likely to use the program as groups with girls. Groups with both a male and female adult were five times more likely to use the program if they had a boy than if they had a girl (50% to 9%). The differences are not so distinct when the column for adult females is compared to that of adult males. Males were somewhat less likely to use the program than females (17% to 25%) when the child was a girl; but if the child was a boy, the gender of the adult made little difference. The highest percentage of use (83%) was observed in groups with a male adult and both a boy and a girl.

Table 2

Percentage of Groups using Grogram by Gender

	Adults		
Children	**Female(s)**	**Male(s)**	**M and F**
None	7%	13%	14%
Girl(s)	25%	17%	9%
Boy(s)	50%	55%	50%
Girl(s) and Boy(s)	20%	83%	25%

By observing families in a spontaneous and somewhat anonymous environment, this research offers a unique vantage point to study the relationship between gender and use of technology. Unfortunately, only a limited number of studies have investigated the relationship between use of technology and gender in the museum setting. In one study, more males were direct users of the computer, but both genders were equally represented as indirect users (Pawlukiewicz, Doering, and Bohling, 1989). In another study utilizing touch screen computers as an orientation device, 65% of the users were males (Sharpe, 1983). The effect of gender may vary with different

audiences and content areas. In this study, the program was popular, and visitors sometimes had to wait to use it. Males may have been more likely to do so. Further research on the use of technology in informal learning environments may help educators understand families' expectations and associations related to the use of technology.

Reactions to the IVD Program

While the device in this study and the size of the monitor limited the number of users, the program seldom had only one user— more often a group was gathered around it. Families crowded onto the two available chairs with the children most often controlling the trackball and parents offering suggestions or pointing at the screen. The average time spent with this program was almost 6 minutes, with 18 minutes as the longest time; this was considerably longer than maximum of three minutes holding time that previous research has shown for other media formats (Beer, 1987). The analysis of options selected showed that 75% of the users created a unique path through the program. For example, one path included returning to the main menu twice, watching three video segments on hawks, and answering three questions related to hawks. The path of another group included using the menu once and viewing the Bald Eagle segment twice. Twenty–four groups repeated at least one video segment.

The level of users' paths was significantly related to self–assessed interest in birds (chi–square, $p<.05$). Level Two users were more likely to have a higher self–assessed interest in birds than Level One users. However, the level was not related to self–assessed computer comfort; there were no significant differences between Level One and Level Two users in the way they assessed their comfort with computers. This suggests that once visitors began to use the system, they felt comfortable interacting with the choices, regardless of their previous exposure to computers. However, as interest in birds and comfort with computers were not measured, but self–reported, these data must be interpreted cautiously.

Summary and Discussion

This study investigated visitor responses to an interactive videodisc program used as a conceptual pre–organizer for an exhibit on endangered birds. The

presence of the interactive videodisc program significantly increased visitors' time within the exhibit area, suggesting increased attention and learning. Groups with children were more likely to use the program than adult only groups. Groups with males (either adult or children) were more likely to use the program than those with females. This provokes questions abou' the relationship between individual characteristics and the use of technology in informal learning settings.

Seventy five percent of the program users selected a unique path through the program. The level of the path (One or Two) was related to "interest in birds" but not to "comfort with computers." This suggests that visitors did take advantage of the option to create a presentation appropriate for their interests and this usage was independent of their comfort with computers.

These results do not suggest that interactive video *should* be used in a museum environment, but rather that it ***can*** be used effectively as a pre–organizer for an exhibit without competing with the exhibit for visitors' attention. Being able to select the content, sequence, pace, and amount of information presented, visitors can actively research their own interests, selecting from a potentially vast number of presentations. This empowering of visitors can be an important advantage for museums and other informal learning institutions which strive to encourage life–long learning for heterogeneous audiences.

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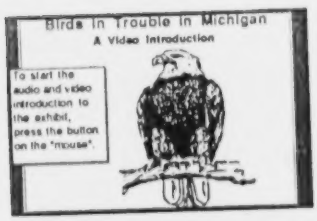
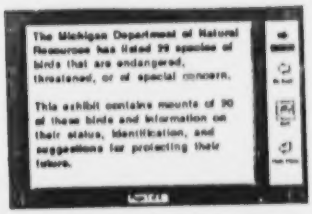
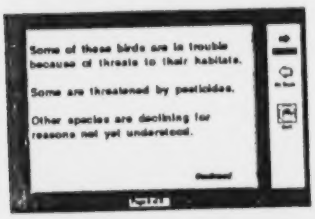
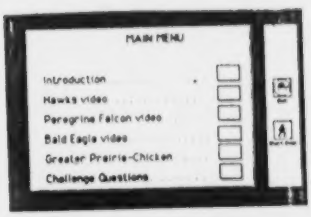
APPENDIX A

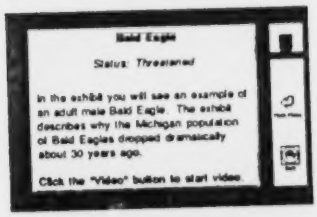
Sample Computer Screens from the Interactive Videodisc Program

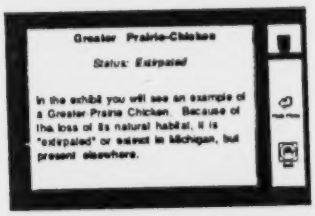

Birds in Trouble in Michigan
A Video Introduction
To start the audio and video introduction to the exhibit, press the button on the "mouse".

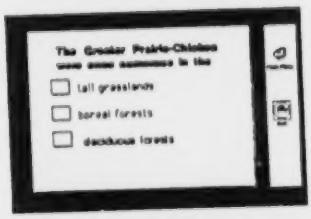

The Michigan Department of Natural Resources has listed 39 species of birds that are endangered, threatened, or of special concern.
This exhibit contains mounts of 30 of these birds and information on their status, identification, and suggestions for protecting their future.

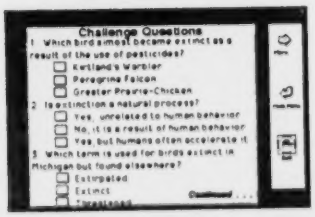

Some of these birds are in trouble because of threats to their habitats.
Some are threatened by pesticides.
Other species are declining for reasons not yet understood.

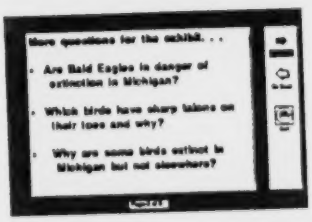



Bald Eagle
Status: Threatened
In the exhibit you will see an example of an adult male Bald Eagle. The exhibit describes why the Michigan population of Bald Eagles dropped dramatically about 30 years ago.
Click the "Video" button to start video.


Greater Prairie-Chicken
Status: Extirpated
In the exhibit you will see an example of a Greater Prairie Chicken. Because of the loss of its natural habitat, it is "extirpated" or extinct in Michigan, but present elsewhere.




Challenge Questions
Which bird almost became extinct as a result of the use of pesticides?
Kirtland's Warbler
Peregrine Falcon
Greater Prairie-Chicken
Is extinction a natural process?
Yes, unrelated to human behavior
No, it is a result of human behavior
Yes, but humans often accelerate it
Which term is used for birds extinct in Michigan but found elsewhere?
Extirpated
Extinct


More questions for the exhibit. . .
Are Bald Eagles in danger of extinction in Michigan?
Which birds have sharp talons on their toes and why?
Why are some birds extinct in Michigan but not elsewhere?

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